# Comparison of Predicted and Actual Water Quality at Hardrock Mines

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The overall purpose of this study is to examine the reliability of pre-mining water quality predictions at hard rock mining operations in the United States. To our knowledge, no effort has previously been made to systematically compare predicted and actual water quality for mines in the U.S. or elsewhere. Environmental Impact Statements (EISs) and similar documents under federal and state law are the single publicly available source of water quality predictions for hard rock mines, and thus they were chosen as the information foundation for conducting the research. In designing the project, we decided to look broadly at as many mines as possible rather than concentrate on an in-depth analysis of a few mines. This approach – which shows general trends and can more easily be extrapolated to the larger set of hard rock mines – will provide the most useful results for mine regulators, which are the principal intended audience for the study. More in-depth studies of individual mines would be a natural next step for continuing investigations.

As part of the study, requests were made to federal and state agencies to provide National Environmental Policy Act (NEPA) documents and information on operational water quality. The effort required to obtain the documents and information, although initially expected to be onerous, was more arduous and protracted than we imagined. We were surprised to find that no single repository exists for NEPA documents, although the Environmental Protection Agency does have most EISs on microfiche. Technical reports associated with EISs were extremely difficult to obtain. Similarly, the availability of operational water quality information was uneven, ranging from disorganized paper-only copies in some states to user-friendly electronic information in others. The authors are grateful to the many agencies that did provide documents and water quality data. One of the most important recommendations in the report is that operational water quality data should be made available to the public in a transparent and easily accessible manner.

The report finds that adverse impacts to water quality are common at mine sites, and they are most often caused by failed mitigation. We recommend that a more in-depth study of the effectiveness of common mitigation measures be undertaken. Another important cause of water quality impacts is errors in geochemical and hydrologic characterization of the mined materials and the mine site area. The companion report (*Predicting Water Quality at Hardrock Mines: Methods and Models, Uncertainties, and State- of-the-Art)* makes a number of concrete suggestions for improving characterization and predictions.

This report also identifies inherent risk factors that may lead to water quality impacts. Although all mines require carefully executed mitigation measures, mines close to water resources with high acid drainage or contaminant leaching potential need special attention in terms of mitigation and characterization. Adopting protective mitigation and characterization approaches, as recommended here and in the companion report, will help prevent unacceptable water quality impacts, decrease long-term costs, and help instill public trust in the industry. This report is ultimately intended to advance the practice of science, engineering and regulation related to water quality prediction, the recognition of risk, and the application of effective mitigation to hardrock mines. The authors encourage ongoing cooperative efforts with regulators, scientists and engineers, non-governmental organizations, and industry to further the work begun in this study.

Copy of report can be obtained at
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